Dynamic Design: Launch and Propulsion

You Get What You Pay For

TEACHER GUIDE

BACKGROUND INFORMATION

This activity involves the economic component of the module and will be conducted prior to the other activities in the interaction/synthesis sections of this module. Students will be given a budget of $150,000 and an approved subcontractor list that has a listing of the materials and costs for construction. Teachers completing this aspect of the module should decide on either using "play" money, checks, or giving the home groups a spreadsheet that they can organize to keep track of their expenditures. Students are cautioned to spend their money wisely and thus save the teacher real money on materials used in this unit. Students are also warned that in order to participate in the final launch they must pay $20,000, plus money for fuel. Students will not receive salary or benefits during this activity. Insurance will not be included either. Teachers wanting to include this either during a discussion or as a modification to this activity are encouraged to do so.

NATIONAL SCIENCE STANDARDS ADDRESSED

Grades 5-8

Science and Technology

Understandings about science and technology

Grades 9-12

Science and Technology

Understandings about science and technology

(View a full text of the National Science Education Standards.)

ECONOMIC STANDARDS ADDRESSED

Grades 6-8

Understands that scarcity of productive resources requires choices that generate opportunity costs

Knows that all decisions involve opportunity costs and that effective economic decision making involves weighing the costs and benefits associated with alternative choices.

Understands that the evaluation of choices and opportunity costs is subjective and differs across individuals and societies

(View a full text of the McREL Compendium of Standards and Benchmarks for K-12 Education)

MATERIALS

- Spreadsheet or balance sheet
- Calculator
- Student Activity, "You Get What You Pay For"

PROCEDURE

1. Distribute the Student Activity "You Get What You Pay For." Have the students read over the directions at the top of the page. Ask students to answer the group discussion section and then share their answers with the rest of their group. Ask your students to,"think about any experiences you have had in managing money. Describe your successes and failures in the space below and share with your group." Once students have had a chance to share within their groups, ask one or more students in each group to share with the class.

2. Prior to the expert group activities, have students complete the budgets for their expert group work, and the competition on their student sheet. They will need to build a preliminary budget for the activities. Since this is the first time to "spend money" and they have little experience in building a water rocket, encourage students to keep their costs down. Students may use this time to consider the materials they would like to use for the expert group work. Describe the next phase of the module by telling students that they will be working in expert groups to test various aspects of the rocket. Different expert groups will experiment with nosecone design, propulsion, and fin design. Since each person will be representing a different "competing team," each person should be given a certain amount of "money" to contribute to the expert group to cover the costs of the materials used in testing. Students should then complete the expert group activities outlined in the teacher guide.

3. Make it clear to the students that each design group has the same budget. Though not realistic, it will give each group the same resources. Explain to the students that each person is expected to contribute funds to support the work done in the expert groups.

4. Finally, explain that the bulk of their budget should be geared for the launch of the water rocket. Make it clear that $20,000 needs to be budgeted for the two launches and they need to have budgeted projected fuel costs.

5. Distribute expert group sheets to the groups. These sheets can be used by the groups to help them estimate their expert group budget.

6. Allow time for students to create their budgets. Circulate around the room assisting where necessary.

7. Encourage students to keep good records of their expenditures during the activities. At the completion of each part of the module, students should take the time to re-evaluate their actual payments versus their budgeted amounts. They should record whether they are over or under budget during each part and then reallocate funds appropriately.

8. You may want to assign the primary budget responsibilities to the principal investigators, as they will be responsible for acquiring materials throughout the module. You may also want to check the design groups budgets periodically to see how each group is handling their funds.

9. At the end of the activity, you may want to recognize the groups with a certificate for being fiscally responsible.